

Claims

1. Method of evaluating a query involving at least one relational database comprising a relational database management system (RDBMS), said query relating to at least one table of said relational database,  
said method comprising  
determining a table of said relational database as a gateway table for evaluating said query,  
retrieving one or more unique identifiers of said gateway table related to one or more entries in a table to be queried,  
retrieving information from one or more tables to be queried related to said retrieved unique identifiers of said gateway table,  
providing a result to said query.
2. Method according to claim 1, wherein said relational database comprises one or more predetermined hub tables and said query relates to at least one table of said relational database and wherein said method comprises:  
retrieving one or more unique identifiers of a hub table related to one or more entries in a table to be queried,  
retrieving information from tables to be queried related to said retrieved unique identifiers of said hub table,  
providing a result to said query.
3. Method according to one of claims 1 or 2, wherein at least one library is defined on one or more of said databases, said library consisting of tables linked to each other and having exactly one table defined as a hub table.
4. Method according to one of claims 1 to 3, wherein said query is for complete sets of related entries of said relational database or of a library or for parts of such complete sets of related entries and comprises one or more query conditions related to said database or library, wherein said method comprises:
  - identifying a gateway table related to entries specified in a query condition,

- identifying one or more unique identifiers of said gateway table related to said entries conforming to query conditions,
  - retrieving complete sets of related entries or part thereof which are related to said unique identifiers of said gateway table.
5. Method according to one of claims 2 to 4, wherein said query involves at least a second searchable entity outside said database or outside a library involved in said query, said second entity comprising sub-entity each having at least one identifier uniquely identifying said sub-entities, and wherein said method comprises:
- retrieving one or more identifiers of sub-entities of said second searchable entity related to said query,
  - retrieving one or more unique identifiers of a hub table of said relational database or library related to said retrieved identifiers of said sub-entities,
  - retrieving sets of related entries or predetermined parts thereof related to said retrieved unique identifiers of said hub table,
  - retrieving information from a sub-entity identified by a retrieved identifier in said second entity,
  - combining the retrieved information from said second searchable entity and said data base or library into a result.
6. Method according to one of claims 2 to 5, wherein said query involves at least a second searchable entity outside said database or outside a library involved in said query and comprising sub-entities, each sub-entity having at least one identifier uniquely specifying said sub-entity, and wherein said method comprises:
- retrieving one or more unique identifiers of a hub table of said database or library related to entries related to said query,
  - retrieving identifiers of sub-entities of said second searchable entity related to said retrieved unique identifiers of said hub table,
  - retrieving sets of related entries or predetermined parts thereof related to said retrieved unique identifiers of said hub table,
  - retrieving information from said sub-entities identified by identifiers retrieved in said second searchable entity,
  - combining the retrieved information from said second entity and said data base or library into a result.

7. Method according to one of claims 5 or 6, wherein said second searchable entity is a relational database or a library and said identifier is a unique identifier of a hub table in said relational database or library.
8. Method according to one of claims 5 or 6, wherein said second searchable entity is a collection of flat files with the sub-entities being flat files in this collection.
9. Method according to one of claims 4 to 8, wherein said step of retrieving a relation between identifiers of said second searchable entity and unique identifiers of hubs of said database or library comprises the step of discarding combinations of identifiers of hubs with identifiers of said second searchable entity which are not consistent with the query conditions and retrieving only such additional information related to an identifier which is comprised in a combination of identifiers consistent with the selection parameters.
10. Method according to one of claims 2 to 9, wherein the query relates to tables related to at least two hub tables, wherein said method comprises:
  - retrieving one or unique identifiers of a hub table or hub tables, said identifier being related to entries satisfying query conditions in tables related to the respective hub,
  - retrieving unique identifiers of the respective other hub or hubs related to said retrieved unique identifiers related to entries satisfying the query conditions,
  - retrieving sets of related entries or predetermined parts thereof, which are related to said retrieved unique identifiers of said hubs according to the query,
  - combining the retrieved information related to said hubs into a result.
11. Method according to claim 10, wherein said step of retrieving a relation between unique identifiers of said hub tables comprises the step of discarding combinations of unique identifiers of hub tables which are not consistent with the query conditions and retrieving only such additional information related to a unique identifier which is comprised in combinations of unique identifiers consistent with the search parameters.

12. Method according to claim 10 or 11, wherein at least one of said hubs is the hub of a library and the query relates to said library.
13. Method according to claim 12, wherein the query relates to two libraries and said hubs are hubs of two libraries.
14. Method according to one of claims 10 to 13, wherein said two hubs are hubs within the same relational database.
15. Method according to one of claims 4 to 14, wherein the step of retrieving unique identifiers of a hub table and/or identifiers of a searchable entity which are related to another unique identifier of a hub table and/or identifier of a searchable entity is performed on the basis of pre-established relations between identifiers of said entities.
16. Method according to one of claims 4 to 14, wherein the step of retrieving unique identifiers of a hub table and/or identifiers of a searchable entity which are related to another unique identifier of a hub table and/or identifier of a searchable entity is performed dynamically during the execution of the query.
17. Method according to one of claims 1 to 16, wherein in performing said step of retrieving information related to a unique identifier of said gateway table, selected tables are queried which, in a graphical representation of the database wherein the tables are represented as nodes and links between the tables are represented as lines between the nodes, form a connected graph connecting the gateway table to tables referred to in the initial query.
18. Method according to claim 17, wherein said step of querying tables on said graph comprises performing consecutive partial queries, wherein a result of a previous query is used as input for a later query, a first of said partial queries involving the gateway table and a query other than the first query relating to a table referred to in the initial query.

19. Method according to claim 18, wherein said result of said previous query comprises the value of a foreign key of a table involved in said later query and wherein said value of said foreign key is used as input for said later query.
20. Method according to claim 18 or 19, wherein the result of said partial queries is stored as an object or objects.
21. Method according to one of claims 18 to 20, wherein after each partial query a redundancy check and/or a check for consistency is carried out in the respective result and the result purged of redundancies and/or inconsistencies is stored.
22. Method according to claim 21, wherein said redundancy check is carried out in creating said object comprising the result of said partial query or directly on said object after creation of the same.
23. Method according to one of claims 18 to 22, wherein each partial query involves a table or a plurality of tables linked to each other and wherein each partial query other than the first has as input previously established values of link keys, said link keys linking said table or one or more of said plurality of tables to another table not involved in said partial query.
24. Method according to one of claims 18 to 23, wherein said graph comprises at least one branch node having links to at least two other nodes and wherein tables referred to in the initial query are related to separate branches deriving from said branch node, wherein a partial query is carried out involving the table corresponding to said branch node (branch table) and wherein at least one partial query is carried out for one or more tables contained in each branch which has the result of the partial query involving the branch table as an input.
25. Method according to one of claims 18 to 24 comprising the steps of
  - identifying the hub table or hub tables related to tables referred to in the initial query,

- determining in said graphical representation of said database, at least for one hub table, an optimum graph connecting said hub to all tables which are related to said hub and which are referred to in the initial query,
  - performing consecutive partial queries involving tables which are consecutive to each other with regard to said optimum graph.
26. Method according to one of claims 1 to 25, wherein said step of retrieving unique identifiers of said gateway table comprises:
- determining a table that is referred to in the initial query,
  - determining, in a graphical representation of said database, wherein tables are represented as nodes and links between tables as lines between the nodes, a gateway table connected to said table,
  - querying said database for one or more indices of the gateway table which are related to said table.
27. Method according to claim 26, wherein one or more specific entries of said table are implied by a query condition and said database is queried for indices of said gateway table which are related to said entry or entries.
28. Method according to claim 26 or 27, wherein in said graphical representation, a path from said table to said gateway table is established and said query for said indices is performed by querying all tables corresponding to nodes in said graph for the values of link keys between the tables in said graph, starting from the table referred to in the query and, given the case, certain entries thereof.
29. Method according to claim 28, wherein said path is selected as a shortest path between said table and said gateway table according to a predetermined metric.
30. Method according to claim 28 or 29, wherein said path is part of or identical to the graph for determining partial queries for retrieving additional information from tables related to said gateway table.
31. Method according to one of claims 26 to 30, comprising the step of:

determining a unique identifier for one or more rows of the gateway table related to said indices, if an index or a group of indices related to the same row of the gateway table determined by said step of querying the database does not uniquely identify a row of said gateway table.

32. Method according to one of claims 1 to 31, wherein partial queries used for evaluating the initial query are at least partially created dynamically during the process of said evaluation.
33. Method according to one of claims 1 to 32, wherein said result is represented in an object oriented representation.
34. Method according to claim 33, wherein the result of said initial query is expressed as an object derived by means of object-relational mapping.
35. Method according to one of claims 1 to 34, wherein said evaluation of said query is performed under the control of an object manager, said object manager comprising a sequence of commands to be executed by a computer system.
36. Method according to claim 35, wherein said object manager handles an object which represents the schema or part of a schema of one or more databases to be queried.
37. Method according to claim 35 or 36, wherein said object manager defines classes which are dynamically created and instantiated.
38. Data processing system for controlling the evaluation of a query involving a relational database comprising a relational database management system (RDBMS), said query relating to at least one table of said relational database, comprising:
  - means for determining a table as a gateway table for evaluating said query,
  - means for establishing a relation between a table or tables to be queried and a gateway table,
  - means for causing the RDBMS to retrieve one or more unique identifiers of said gateway table related to one or more entries in a table to be queried,

- means for causing the RDBMS to retrieve information from tables to be queried related to said retrieved unique identifiers of said entry,
  - means for providing or causing to be provided a result to said query.
39. Data processing system according to claim 38, comprising means for setting certain tables in said relational database as predetermined gateway tables for queries to be evaluated.
40. Data processing system according to claim 38 or 39, comprising means for controlling the execution of a method according to one of claims 1 to 37 by a data processing system or data processing systems.
41. Computer program causing a computer or computer system, when executed thereon, to perform the steps of a method according to one of claims 1 to 37.
42. A computer readable storage medium, comprising a program according to claim 41.